

# Length structure, sex ratio and size at first maturity for the drab tonguefish *Symphurus melanurus* (Cynoglossidae) from the North Pacific coast of Mexico

by

Felipe AMEZCUA (1) & Hugo AGUIRRE (2)

**RÉSUMÉ.** - Structure de la taille, sex ratio et taille à la première maturité pour la langue terne, *Symphurus melanurus* (Cynoglossidae) de la côte Pacifique nord du Mexique.

Un spécimen de langue terne, *Symphurus melanurus* Clark, 1936, de 241 mm de longueur totale a été pêché avec un chalut de fond, à une profondeur de 5 m, sur la côte Pacifique du nord du Mexique. Cette taille est 30% plus grande que la longueur maximale connue pour cette espèce. Le test *t* de Student ( $p > 0,05$ ) a montré que ce spécimen appartient à une cohorte différente, plus âgée, que le reste de l'échantillon. La proportion des sexes était 1:1,5 (femelle: mâle). Des différences significatives n'ont pas été trouvées entre la distribution de fréquence de longueur des femelles et celle des mâles ( $p > 0,05$ ). La taille estimée à la première maturité sexuelle est de 125,3 mm pour les femelles et 126,7 mm pour les mâles. Près de 100% des spécimens de *S. melanurus* examinés étaient sexuellement matures.

**Key words.** - Cynoglossidae - *Symphurus melanurus* - PSE - Morphometric features - By-catch - Sinaloa.

The life history of many tropical flatfish species has not been studied extensively, mostly because of their small economic importance. Species of *Symphurus* are distributed worldwide, but predominantly in tropical environments, being more diverse on the coasts of the Americas than in the rest of the world (Munroe *et al.*, 1991).

Studies on the biology of members of this genus are scarce. Particularly for *Symphurus melanurus*, where the few studies undertaken on this species are limited to those by Munroe (1990) and Munroe *et al.* (1995) on taxonomy and distribution aspects.

*Symphurus melanurus* is a tropical species distributed in the Eastern Pacific, from Mexico to Ecuador, it inhabits sandy and muddy bottoms, frequently in estuaries and inlets, with a depth range from shallow up to 35 m (Munroe *et al.*, 1995). This species is taken in the shrimp trawl fisheries as by-catch, but it is not commercially exploited (Perez-Mellado and Findley, 1985). The maximum standard length (SL) reported for this species is 186 mm (Munroe *et al.*, 1995). However, on February 10<sup>th</sup> 2005, two large *S. melanurus* including one specimen with a SL above that previously reported, were captured by shrimp trawler off the coast of Sinaloa, Mexico.

Maximum length is an important theoretical parameter in the stock assessment of exploited populations (Borges, 2001); therefore, it is important to update the maximum known size of a species when this information becomes available. *S. melanurus* is not

exploited due to its small size, the low volume of its captures, and because of the low price in the market when compared to the price of other species, but this species could be considered to be commercially important if it is demonstrated that it can reach larger and commercially exploitable sizes. This acquires importance in the area of the present study since most of the by-catch from the shrimp trawls is discarded (Hill and Wassenberg, 1990).

## MATERIALS AND METHODS

Demersal trawl hauls were carried out by the National Fisheries Institute of Mexico on board small boats 7.5 m long fitted with out-board engines of 75 to 115 hp, as part of the yearly assessment of the shrimp population along the coast of Sinaloa. The trawl is fitted with a footrope of 24 m and a 50 mm liner in the cod end. Data of the present study came from four trawl hauls undertaken on the 10<sup>th</sup> of February 2005 outside the south part of the coastal lagoon of Huizache Caimanero (22°48'05"N-106°04'06"W to 22°49'11"N-106°02'50"), at depths of 3 to 20 m (Fig. 1). After every haul, all fishes present as by-catch were kept in plastic bags

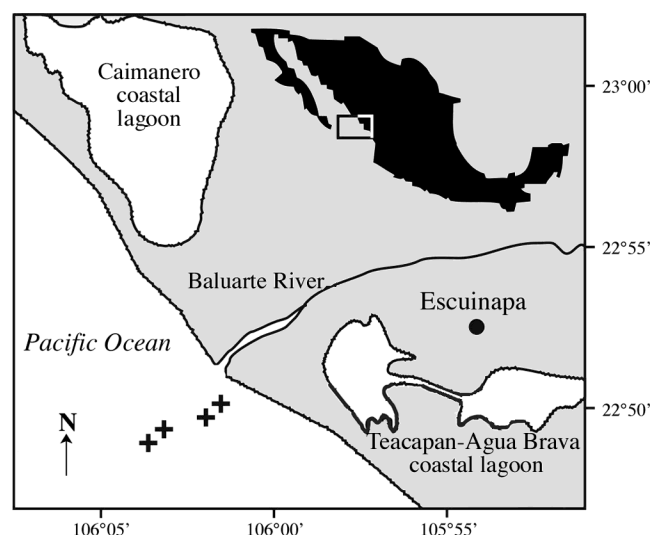


Figure 1. - Map of Northern Mexico indicating location of sampling area (crosses). [Carte de la côte nord Pacifique du Mexique montrant la zone d'échantillonnage (croix)].

(1) Instituto de Ciencias del Mar y Limnología, UNAM, Joel Montes Camarena s/n, Col. Playa Sur, CP 82040, Mazatlán, Sinaloa, MEXICO.

(2) Instituto Nacional de la Pesca, Centro Regional de Investigación Pesquera, Mazatlán, Calzada Sábalo-Cerritos s/n, AP 1177, CP 82010, Sinaloa, MEXICO. [haguirre@ola.icmyl.unam.mx]

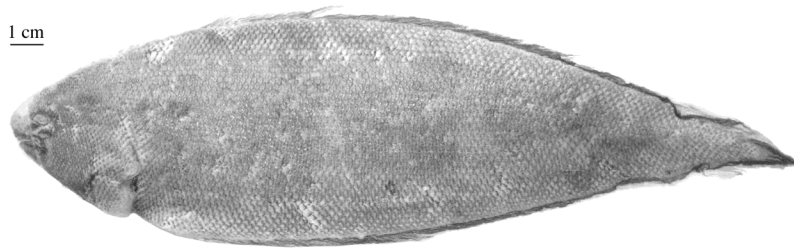


Figure 2. - Ocular side of dab tonguefish, *S. melanurus*, collected outside the coastal lagoon of Huizache-Caimanero, measuring 241 mm Total length (TL). [Face oculée de la langue terne, *S. melanurus*, d'une taille de 241 mm LT, pêchée sur la côte de la lagune de Huizache Caimanero.]

and frozen. In the laboratory, fishes were identified to species, and total length (nearest mm) and weight (nearest 0.1 g) were recorded for every specimen. The organisms of *S. melanurus* were sexed macroscopically through direct observation of the gonads.

For both sexes, the length at first maturity was estimated using a logistic model:

$$L_{50\%} = (1/1 + e^{\alpha - \beta \cdot TL_i}) * 100$$

where  $\alpha$  and  $\beta$  are fit parameters and TL is total length.

The normal distribution of the length frequency polygon was fitted by least squares. A Student *t*-test was undertaken to determine if different modes found in length frequencies were statistically different which would indicate the presence of multiple cohorts among the studied population.

## RESULTS

A total of 143 specimens of *S. melanurus* were caught. The total length (TL) of these fish ranged from 98 to 241 mm; the two largest organisms were caught in the first haul at a depth of 20 m; they showed TL equal and above the reported value by Munroe *et*

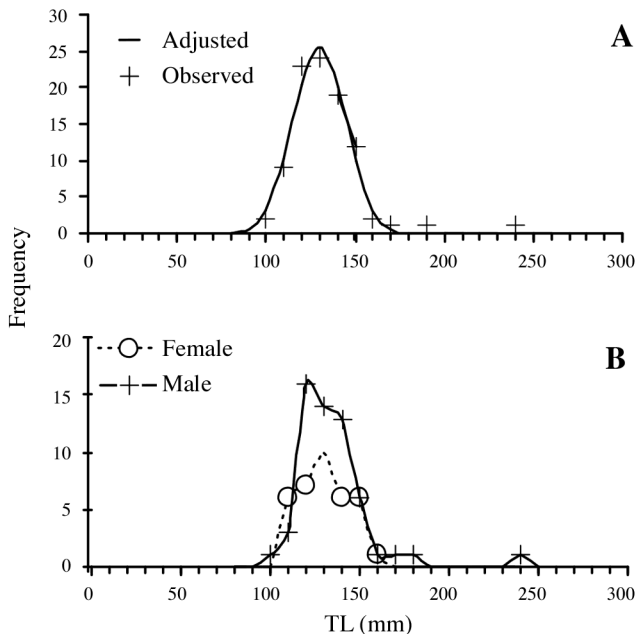


Figure 3. - Length frequency polygon of *S. melanurus*: A: For whole sample; B: By sex. [Polygone de fréquence des tailles de *S. melanurus*: A : Tout l'échantillon; B : Par sexe.]

*al.* (1995); these were two specimens of 186 mm (58.3 g), and 241 mm (110.9 g) (Fig. 2). These lengths are also above the maximum total lengths reported in different Ichthyological collections for this species (Collection of the California Academy of Sciences, 169 mm TL; Scripps Institution of Oceanography Collection, SL 173 mm).

The Student *t*-test showed that these two largest specimens did not belong to the modal group that included almost all of the *S. melanurus* collected. ( $P = 9.98E-03$  and  $P = 5.69E-04$ ). For the whole sample, a well-defined cohort was observed with a mean length of 129.8 mm SD 14.7 mm. A Student *t*-test determined that the organisms of 186 and 241 mm in length belong to

a different, perhaps older cohort than the other specimens found in the whole sample (Fig. 3A).

The two largest organisms were not dissected because they were deposited into an ichthyological collection. However based in colour patterns, and in the fact that ovaries were not observed when using transmitted light, both specimens were determined to be mature males, because they have much darker (almost black) posterior dorsal, anal and caudal fins (Munroe, 1990). The sex ratio for *S. melanurus* from the four samples was 1:1.5 (female: male). Significant differences were not found between the length frequency distribution of females and males ( $p > 0.05$ ,  $\mu = 129.8$ ,  $sd = 16.2$  for females, and  $\mu = 129.9$ ,  $sd = 13.5$  for males) (Fig. 3B).

The observed range length at sexual maturity for females was 110-160 mm TL. The 50% maturity size was attained at 125.3 mm (Fig. 4A). For the males, the observed length at sexual maturity ranged between 100-241 mm TL. The length at which 50% of the male population reached maturity was 126.7 mm TL (Fig. 4B).

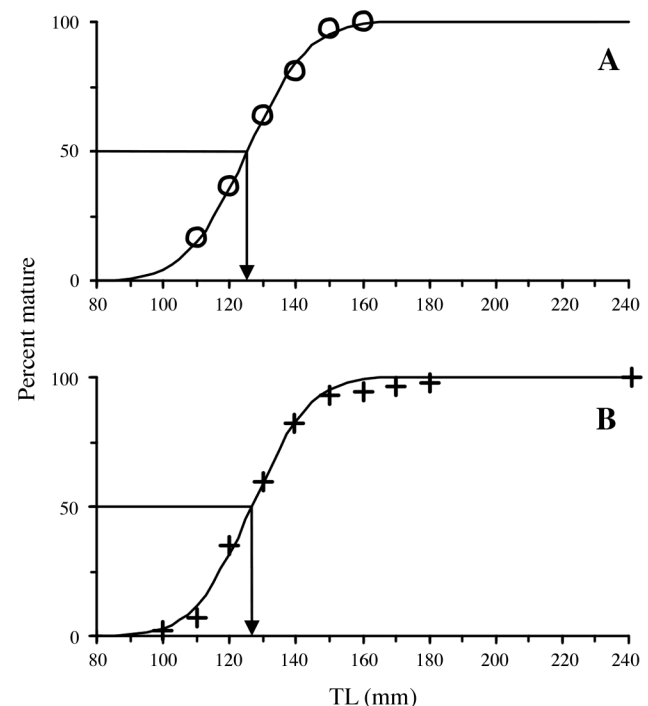


Figure 4. - Length at maturity for drab tonguefish, *S. melanurus*: A: Females; B: Males. Arrow represents length at 50% maturity. [Taille de première maturité sexuelle pour la langue terne, *S. melanurus*: A : Femelles; B : Mâles. La flèche indique la taille à 50% de maturité.]

Table I. - Morphometric and meristic features (mm) for two *S. melanurus* (PI 349) caught off northern Mexico. Measurements and counts follow Munroe (1998), except TL. [Mesures morphométriques et méristiques (mm) pour les deux spécimens (PI 349) de *S. melanurus* pêchés sur la côte nord Pacifique du Mexique. Les mesures et comptages ont été pris en suivant Munroe (1998), sauf la LT.]

Morphometric features (mm)					
Total length	241	186	Head length	42	30
Standard length	225	175	Head width	47	43
Trunk length	201	143	Postorbital head length	29	22
Body depth	65	54	Upper head lobe width	31	23
Preanal length	45	37	Lower head lobe width	22	20
Dorsal fin length	231	167	Snout length	11	8
Predorsal length	10	8	Upper jaw length	9	9
Anal fin length	196	138	Eye diameter	3	3
Caudal length	16	12	Chin depth	19	11
Pelvic fin length	14	10	Upper opercular lobe	11	10
Pelvic to anal length	9	9	Lower opercular lobe	15	10
Meristic features					
Longitudinal scale count	95	94	Dorsal fin rays	97	98
Head scale count	23	24	Anal fin rays	84	80
Lateral scale count	38	36	Caudal fin rays	12	12

Morphometric features scale and fin-rays counts of the two largest specimens were taken following Munroe (1998). The proportion of morphometric features is presented in table I. The fin ray counts agreed, for both specimens, with the counts given by Munroe *et al.* (1995) for this species.

These specimens were deposited in the Ichthyological Reference Collection of the Instituto de Ciencias del Mar y Limnología UNAM, Unidad Mazatlán, with the catalogue number PI 1340. The specimens are preserved in 70% ethanol after being fixed in 10% formalin.

## DISCUSSION

Many tonguefishes typically exhibit sexual dimorphism in length, in 11 out of 23 species from the western Atlantic, females reached larger length than males; in 6 out of 23 species males reached larger length than females, and in the remaining 7 species sexual dimorphism was not found (Munroe, 1998). Although, Terwilliger and Munroe (1999) indicate that, because the age has not been estimated for this species of *Symphurus*, comparative data on dimorphism in length at age are unavailable. In our work, significant differences were not found between the length frequency distribution of females and males, the same pattern was found in *Symphurus plagiatus* in Chesapeake Bay, Virginia (Terwilliger and Munroe, 1999), however, the two largest individuals were males, which could suggest that in *Symphurus melanurus* males are larger than females but further studies are needed to confirm this.

First maturity (50% of population sampled) for both sexes was attained at a length close to 130 mm TL. Almost 100% of the *S. melanurus* sampled were sexually mature. The sex ratio of *S. melanurus* sampled during this study deviated from 1:1 mostly due to large male catch during the four trawl hauls sampled. However we did not find some spatial separation of the sexes as Terwilliger and Munroe (1999) found in *S. plagiatus*. This tendency could be due to an inadvertent selection of sex by the fishery because of different intersexual behaviours, rather than to a real difference in the

sex ratio or to a difference in larval and juvenile mortalities between males and females.

Most of the *S. melanurus* collected belong to a well defined cohort; however, the two largest individuals are not part of this group, which indicates that they may be older. However, this cannot be ascertained because age information is not available, and probably they were of the same cohort as the others, but were just fast growing individuals.

Although specimens of this size may not be very abundant, fish of these lengths may not be uncommon either, since they were caught in an area with intense fishing pressure. However due to lack of interest, data for this species are not usually reported, or members of this species can be confused with individuals of larger tonguefish species, since the different species in this family are very similar. To our knowledge, the maximum length of the specimens reported here is 30% larger than that previously reported in published documents and in Ichthyological collections for this species, however, the two organisms presented morphometric measurements within intervals described for this species (Munroe, 1990, 1998).

## REFERENCES

- BORGES L., 2001. - A new maximum length for the snipefish *Macroramphosus scolopax*. *Cybiurn*, 25: 191-192.
- California Academy of Sciences, Department of Ichthyology, Collection data base (<http://www.calacademy.org/research/ichthyology/collection/index.asp>)
- HILL B.J. & T.J. WASSENBERG, 1990. - Fate of discards from prawn trawlers in Torres Strait. *Aust. J. Mar. Freshw. Res.*, 41: 53-61.
- MUNROE T.A., 1990. - *Symphurus melanurus* Clark, 1936, a senior synonym for the eastern Pacific tonguefishes, *S. seychellensis* Chabanaud, 1955, and *S. sechurae* Hildebrand, 1946. *Copeia*, 1: 229-232.
- MUNROE T.A., 1998. - Systematics and ecology of tonguefishes of the genus *Symphurus* (Cynoglossidae: Pleuronectiformes) from the western Atlantic Ocean. *Fish. Bull.*, 96: 1-182.
- MUNROE T.A., NIZINSKI M. & M.N. MAHADEVA, 1991. - *Symphurus prolatinarius*, a new species of shallow-water tonguefish (Cynoglossidae: Pleuronectiformes) from the eastern Pacific. *Proc. Biol. Soc. Wash.*, 104: 488-458.
- MUNROE T.A., KRUPP F. & M. SCHNEIDER, 1995. - Cynoglossidae. Lenguas, lenguetas. In: Guía FAO para Identificación de Especies para lo Fines de la Pesca. Pacífico Centro-Oriental, Vol. 2 (Fischer W., Krupp F., Schneider W., Sommer C. & V. H. Niem, eds.), pp 1039-1059. Rome: FAO.
- PEREZ-MELLADO J. & L.T. FINDLEY, 1985. - Evaluación de la Ictiofauna acompañante del Camarón capturado en las Costas de Sonora y Norte de Sinaloa, México. In: Recursos Pesqueros potenciales de México: La Pesca acompañante del Camarón (Yáñez-Arancibia A., ed.), pp. 201-254. México: PUAL, ICML, INP.
- Scripps Institution of Oceanography, Univ. of California, San Diego. Marine Vertebrates Collection. (<http://collections.ucsd.edu/mv/index.cfm>)
- TERWILLIGER M.R. & T.A. MUNROE, 1999. - Age, growth, longevity, and mortality of blackcheek tonguefish, *Symphurus plagiatus* (Cynoglossidae: Pleuronectiformes), in Chesapeake Bay, Virginia. *Fish. Bull.*, 97: 340-361.

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